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LASER FILAMENTATION SIMULATIONS WITH NONLINEAR HYDRODYNAMICS*

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Recent application of our laser filamentation code to high temperature hohlraums (*e.g.*, $I = 10^{16} W/cm^2, T_e = 10keV$), or channeling experiments where nearly all of the mass is evacuated from a cavity, have motivated the development, and integration into **F3d**, of a 3D nonlinear eulerian hydrodynamics (**Nh3**).

The specifics of **Nh3** and some applications to beam deflection were reported last year [1,2]. Since then, a linearized model for nonlocal thermal conduction has been added to **Nh3**, and the whole package integrated into the **F3d** code. Laser propagation is carried out by solving the paraxial wave equation. The hydrodynamics equations are solved using a split step method with 2^{nd} order upwinding van Leer approximations. Nonlocal heat transport includes electron heating by inverse brehmsstralung, and allows simulating thermally driven. as well as ponderomotively driven, filamentation.

In this presentation, we will show **F3d** simulations for high temperature hohlraums where the filamentation gain per speckle is large, when an extremely tight focus in a plasma is achieved (similar to Peter Young's experiments on Janus[3]), and in channeling experiments where near vacuum is achieved.

[1] *C. H. Still. R. L. Berger, A. B. Langdon, E. A. Williams and D. S. Miller*, "Nonlinear Eulerian Hydrodynamics in Three Dimensions and Applications to Beam Deflection", 25^{th} Anomalous Absorption Conference, Aspen CO. 27 May - 1 June, 1995.

[2] *C. H. Still. R. L. Berger, A. B. Langdon, E. A. Williams and D. S. Miller*, "3D Nonlinear Hydrodynamics with Beam Deflection Applications", APS Division of Plasma Physics Meeting, Louisville KY. 6-11 November, 1995.

[3] *P. E. Young, J. H. Hammer, S. C. Wilks and W. L. Kruer*, "Laser beam propagation and channel formation in underdense plasmas", Phys. of Plasmas. **2** 7 (1995).

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